Complete Summary

GUIDELINE TITLE

Evidence-based clinical practice guideline of community-acquired pneumonia in children 60 days to 17 years of age.

BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence-based clinical practice guideline of community-acquired pneumonia in children 60 days to 17 years of age. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2000. 11 p. [82 references]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Community acquired pneumonia

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Infectious Diseases
Internal Medicine

Pediatrics
Pulmonary Medicine

INTENDED USERS

Advanced Practice Nurses
Nurses
Pharmacists
Physician Assistants
Physicians
Respiratory Care Practitioners

GUIDELINE OBJECTIVE(S)

To help practitioners at all levels of experience refine their knowledge of community acquired pneumonia and select among the options for evaluation and management.

TARGET POPULATION

These guidelines are intended primarily for use in children 60 days through 17 years of age with signs, symptoms, or other findings suggesting a diagnosis of uncomplicated pneumonia acquired by exposure to organisms in the community.

Exclusions: The guidelines do not address all considerations needed to manage patients with the following:

- "Toxic" appearing or requiring intensive care.
- Persistence of a neonatal cardiac or pulmonary disorder.
- Recent hospitalization with exposure to nosocomial flora.
- Likely aspiration of a foreign body or stomach contents.
- Congenital, acquired, or drug induced immunocompromise.
- Chronic conditions, such as cystic fibrosis, that uniquely alter pathophysiology and care options.

INTERVENTIONS AND PRACTICES CONSIDERED

Assessment and Management

1. Clinical assessment, including signs of respiratory distress, use of the World Health Organization age specific criteria for tachypnea, and overall appearance and behavior.
2. Chest radiographs.
3. Laboratory tests (white blood cell count and differential, sputum Gram stain and culture, pleural culture, purified protein derivative and other skin tests for children with a history of exposure).
   Note: Blood cultures, serologic testing for specific pathogens, and measures of acute phase reactants are considered but not recommended for routine studies.
4. Antibiotic treatment with amoxicillin, parenteral ceftriaxone (Rocephin®), cefuroxime axetil (Ceftin®), clarithromycin (Biaxin®), azithromycin

(Zithromax®), cefprozil (Cefzil®), doxycycline, erythromycin, penicillin G, clindamycin (Cleocin®).
5. Considerations for inpatient management.

MAJOR OUTCOMES CONSIDERED

- Statistical performance of laboratory tests and clinical assessment methods: Sensitivity, specificity, and positive and negative predictive values
- Efficacy of drug treatments

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

82 source documents

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Evidence Based Grading Scale:

A: Randomized controlled trial: large sample

B: Randomized controlled trial: small sample

C: Prospective trial or large case series

D: Retrospective analysis

E: Expert opinion or consensus

F: Basic laboratory research

S: Review article

M: Meta-analysis

Q: Decision analysis

L: Legal requirement

O: Other evidence

X: No evidence

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Articles were divided among team members, with two or more members assigned to the same articles to assure that results were analyzed from several different perspectives.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The recommendations contained in this document were formulated by a working group that included community and hospital based physicians, nurses, respiratory therapists, and others, who examined current local clinical practices and performed extensive and critical literature reviews.

During formulation of these guidelines, the committee members have remained cognizant of controversies and disagreements over the management of these patients. They have tried to resolve controversial issues where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guidelines have been reviewed and approved by Children's Hospital Medical Center senior management, Legal Services, the Institutional Review Board, and other hospital committees and individuals.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Each recommendation is followed by evidence grades (A-X) identifying the type of supporting evidence. Definitions of the evidence grades are presented at the end of the Major Recommendations field.

Clinical Assessments

1. It is recommended that practitioners consider signs of respiratory distress including tachypnea, subcostal retractions, cough, crackles, and decreased breath sounds as possible predictors of pneumonia in children. The predictive value of these signs is strongest when the child is febrile, cyanotic, or when more than one of these signs of breathing dysfunction is present (Margolis & Gadomski, 1998 [S,E]).
    - Note 1: The presence of tachypnea has a sensitivity of about 70% and specificity of 40-70% for pneumonia confirmed by radiography in children up to 2 years of age (Taylor et al., 1995 [C]).
    - Note 2: The lowest positive predictive value for tachypnea is 20% in children 2 years of age or younger. The absence of tachypnea has a negative predictive value of 60-88% in this group (Leventhal, 1982 [C]; Morley, 1991 [D]; Taylor et al., 1995 [C]; Zukin et al., 1986 [C]).
    - Note 3: The absence of fever is reported to have a negative predictive value of up to 97% for children under 17 years of age when temperature has not been modified by antipyretics (Zukin et al., 1986 [C]).
    - Note 4: An acute exacerbation of asthma can be triggered by pneumonia.
2. It is recommended that practitioners use the World Health Organization age specific criteria for tachypnea (see Table 1, below). Respiratory rates are best determined over a full 60-second period and repeated observations recommended whenever there are inconsistencies. Respiratory patterns and rates in children are frequently modified by periodic behavioral and physiologic factors (Leventhal, 1982 [C]; Morley, 1991 [D]; Taylor et al., 1995 [C]; Zukin et al., 1986 [C]; Berman & Simoes, 1991 [S,E]; Singhi et al., 1994 [C]).

Table 1.

Age	Approximate Normal Respiratory Rates (breaths/min)	WHO Tachypnea threshold (breaths/min)
2-12 months	25-40	50

1-5 years	20-30	40
>5 years	15-25	20

- Note: Tachypnea may not be present in a child with pronounced retractions or other signs of increased work of breathing (World Health Organization [WHO], 1999 [E]).

3. It is recommended that the severity of pneumonia be assessed based on overall clinical appearance and behavior including an assessment of the child's degree of alertness and willingness to accept feedings. Subcostal retractions and other evidence of increased work of breathing increase the likelihood of a more severe form of pneumonia (WHO, 1999 [E]).
4. It is recommended that children be assessed with an awareness that a small proportion of patients under five years of age may present without classical findings of pneumonia (Bachur, Perry, & Harper, 1999 [D]). In acutely ill and febrile children, pneumonia also may present as pain referred to the abdomen (Jona & Belin, 1976 [D]; Ravichandran & Burge, 1996 [D]; Local expert consensus).

Radiologic Assessments

5. It is recommended that chest radiographs be considered in children less than 5 years of age with high fevers and high white blood cell (WBC) counts of uncertain source (Bachur, Perry, & Harper, 1999 [D]).
6. It is recommended that for children with clinical evidence of pneumonia, chest radiographs be obtained when clinical findings are ambiguous, when a complication such as a pleural effusion is suspected, or when pneumonia is prolonged and unresponsive to antimicrobials (Tew, Calenoff, & Berlin, 1977 [D]; Bushyhead et al., 1983 [A]; Alario et al., 1987 [C]; Swingler, Hussey, & Zwarenstein, 1998 [A]; Bachur, Perry, & Harper, 1999 [D]).
    - Note 1: In most studies of pneumonia, a positive chest radiograph was necessary to qualify a patient for study entry. This selection constraint makes it difficult to assess the degree to which chest radiographs are actually needed to diagnose pneumonia in a clinical setting.
    - Note 2: Although chest radiographs may be useful in isolated cases (Bushyhead et al., 1983 [A]), they have not consistently been shown to alter management decisions, nor uniformly influence a patient's time to recovery (Swingler, Hussey, & Zwarenstein, 1998 [A]).
    - Note 3: In the majority of peer reviewed articles, radiographs have not been shown to correctly distinguish viral from bacterial pneumonia (Tew, Calenoff, & Berlin, 1977 [D]; Alario et al., 1987 [C]; Bettenay, de Campo, & McCrossin, 1988 [D]; Korppi et al., 1993 [C]). In one publication, radiologic findings were reported to provide reliable indicators for distinguishing viral from bacterial pneumonia (Swischuk & Hayden, 1986 [D]), but a follow-up study by different authors was not able to duplicate these results (Bettenay, de Campo, & McCrossin, 1988 [D]).
    - Note 4: The perceived need and ordering of a chest radiograph is expected to be inversely and appropriately related to the clinician's experience in auscultating a child's chest [Evidence Grade: Local expert consensus].

Laboratory Assessments

7. It is recommended that a white blood cell count and differential be considered when adjunctive information is judged necessary to help decide whether to use antibiotics during management (Tew, Calenoff, & Berlin, 1977 [D], Bachur, Perry, & Harper, 1999 [D]).
    - Note 1: The majority of published reports conclude that the likelihood of a bacterial cause generally increases as white blood cell counts increase above 15,000-20,000/mm^3 and, especially when associated with fevers higher than 39 degrees C (102 degrees F) (Shuttleworth & Charney, 1971 [C]; Hickey, Bowman, & Smith, 1996 [D]; Jadavji et al., 1997 [S, E]; Bachur, Perry, & Harper, 1999 [D]), but these relationships have not been documented in all studies (Wubbel et al., 1999 [A]; Ruuskanen & Mertsola, 1999 [S,E]).
8. It is recommended that sputum Gram stain and culture on high quality specimens be considered when managing children and adults with more severe disease. Pleural cultures are also considered particularly valuable prior to starting antibiotics when managing a child with an effusion. When uncertain about the management of an effusion, consultation with a specialist in pediatric pulmonary diseases is appropriate (Hardie et al., 1996 [D]; Bartlett et al., 1998 [S,E]).
    - Note 1: A high quality sputum is usually defined by the presence of less than 10 squamous epithelial cells and greater than 25 white blood cells per low power field (Bartlett et al., 1998 [S,E]).
9. Blood cultures are not recommended as routine studies for outpatients. Blood cultures are recommended for inpatients with more severe forms of pneumonia (Hickey, Bowman, & Smith, 1996 [D]).
    - Note 1: When pneumonia is diagnosed in a child encountered as an outpatient, the likelihood of a positive blood culture is less than 5% (Hickey, Bowman, & Smith, 1996 [D]).
    - Note 2: Blood cultures may be helpful for inpatients with more severe, resistant, or other unusual form of pneumonia. Their utility is limited when antibiotics administered prior to culture, alter the reliability of the results (Kuppermann et al., 1997 [C]; Bartlett et al., 1998 [S,E]; Local expert consensus).
10. Neither cultures nor serologic testing for specific pathogens such as Mycoplasma pneumoniae or Chlamydia pneumoniae are recommended as routine studies. It is recommended that these and other tests such as viral cultures, detection of viral antigens, and cold agglutinins be used only when the results might alter management decisions (Bartlett et al., 1998 [S,E]; Skerrett, 1999 [S,E]; Honda et al., 2000 [D]).
    - Note 1: The Children's Hospital Medical Center Pathology lab offers a respiratory polymerase chain reaction panel for respiratory syncytial virus (RSV) A and B, influenza A and B, and parainfluenza 1, 2, and 3. Turnaround time is approximately 24 hours after receipt in the lab (Paton et al., 1992 [F]; Claas et al., 1993 [F]). Sensitivity is about 90-95%; specificity 95% (provided the specimen is adequate).
    - Note 2: Polymerase chain reaction Mycoplasma pneumoniae at Children's Hospital Medical Center is sent to an outside laboratory with approximately a one week turn around time and has a sensitivity of about 80% (Honda et al., 2000 [D]).
11. Although C reactive protein (CRP), erythrocyte sedimentation rate (ESR), and other measures of acute phase reactants have been documented to be

abnormal in cases of pneumonia, these tests are not specific enough to recommend as routine studies (Korppi, Heiskanen-Kosma, & Leinonen, 1997 [C]; Ruuskanen & Mertsola, 1999 [S,E]).

12. Purified protein derivative and other skin tests are always considered appropriate for children with a history of exposure including personal or family travel in areas where tuberculosis is prevalent [Local expert consensus].
13. It is recommended that when historical, physical, radiologic, or laboratory findings are inconsistent, additional studies be considered to evaluate for alternative or coincident conditions, such as foreign body aspiration or immunodeficiency.

Treatment Recommendations

14. It is recommended that high dose amoxicillin* for 7-10 days be used to treat children 60 days to 5 years of age when a bacterial cause for community acquired pneumonia is likely. Streptococcus pneumoniae is the most commonly identified bacterial organism for outpatient children in this age range (Bartlett & Mundy, 1995 [S,E]; Local expert consensus). Initiating therapy with a single parenteral dose of ceftriaxone prior to starting oral antibiotics has also been shown effective for infants. In addition, a single initial dose of ceftriaxone is recommended for consideration when treating children who are vomiting or otherwise aversive to a first dose of oral medication (Chumpa, Baucher, & Harper, 1999 [D]; Local expert consensus).

    Note: See Table 2 in the original guideline document for antibiotic treatment regimens for outpatient community acquired pneumonia, and for a discussion of the issue of resistance and the use of high dose amoxicillin.

    - Note 1: Antibiotic therapy is usually continued for 7-10 days although there are no controlled trials supporting this practice.
    - Note 2: When there are indications that a child may be allergic to penicillins, it is recommended that a practitioner consider using a macrolide or cephalosporin for treating community acquired pneumonia. If the causative organism is not a penicillin resistant S. pneumoniae, a macrolide will usually provide adequate coverage for all 3 of the most commonly encountered non-viral organisms: Streptococcus pneumoniae, Mycoplasma pneumoniae, and Chlamydia pneumoniae. Although 5-10% of Streptococcus pneumoniae are estimated to be cephalosporin resistant, as a corollary, the use of a cephalosporin will usually be effective for treating 90-95% of Streptococcus pneumoniae and is recommended when there is concern that the causative agent may be penicillin or macrolide resistant. In the rare case when a practitioner does not judge either the use of a macrolide or cephalosporin antibiotic appropriate, consultation with a specialist in infectious diseases is recommended for consideration [Evidence Grade: Local expert consensus].
15. It is recommended that practitioners consider the use of a macrolide when treating community acquired pneumonia in a child greater than 5 years of age. Macrolides for 7-10 days usually provide effective coverage for Mycoplasma pneumoniae and Chlamydia pneumoniae, the organisms more likely to be the cause of community acquired pneumonia as children grow

older. A macrolide will concurrently provide coverage for penicillin sensitive Streptococcus pneumoniae, the most common bacterial cause of community acquired pneumonia in all age groups (Klein, 1997 [S,E]).

- Note 1: Streptococcus pneumoniae can be responsible for up to 30% of bacterial pneumonias in children of all ages. Approximately 20-23% of Streptococcus pneumoniae isolates in Southwest Ohio are resistant to penicillins. An organism resistant to penicillin is often resistant also to erythromycin. Erythromycin resistance generally suggests resistance to all macrolides (Campbell & Silberman, 1998 [S]).
- Note 2: A beta lactam agent such as high dose amoxicillin or parenteral ceftriaxone might be considered in combination with a macrolide to provide broader coverage for patients judged to have more severe pneumonias. In general, however, the use of monotherapy is recommended pending observation to see how the patient responds to the first line therapy.
- Note 3: Due to the long tissue half-life of azithromycin, patients receiving this macrolide may only need a 5-day treatment course. There are no demonstrations, however, of any macrolide being more efficacious than another for treating Mycoplasma pneumoniae or Chlamydia pneumoniae (Klein, 1997 [S,E]).

16. It is recommended that within 24-72 hours of initial assessment, practitioners follow-up by phone or return visit, on all patients suspected or proven to have pneumonia, including patients not initially started on antibiotics because a viral cause was considered highly likely. This likelihood is higher during some viral endemics, in infants with typical bronchiolitis, and in those with mild reactive airway disease. For those initially started on antibiotics, it is recommended that practitioners follow-up to confirm the efficacy of the first antibiotic choice. If, after physical, radiologic, and laboratory reassessment of children with unresolving signs and symptoms, the practitioner still believes the child has uncomplicated pneumonia, initiating a second or alternative antibiotic is reasonable.

Inpatient Management Considerations

17. Any child might appropriately be considered a candidate for inpatient management. This applies especially to children with more severe or complicated pneumonias, those requiring oxygen or intravenous therapies, or those living in households without resources to comply with treatment plans.
    - Note 1: Adjunctive therapies, including those directed toward airway clearance such as postural drainage and positive expiratory pressure, have not been demonstrated to be helpful in patients with uncomplicated pneumonia. These are not considered of sufficient value to justify admitting a child to the hospital only for these therapies (Hardy, 1994 [S,E]).
    - Note 2: Many patients admitted to the hospital have complicated problems that require modified therapies. The specific inpatient management of children with pneumonia, therefore, is not part of this guideline. Parenteral antibiotic doses for inpatient use have been tabulated in Table 3 in the guideline document for convenience. The oral antibiotic choices tabulated in Table 2 in the guideline document (for outpatient antibiotic treatment) also remain relevant for use in

those admitted and particularly those being switched from intravenous to oral therapy prior to hospital discharge.

- Note 3: Recommended discharge criteria for inpatients:
  - Child taking adequate oral intake
  - Antibiotic therapies can be continued at home
  - Family understands and agrees to prescribed therapies and follow-up plans
  - Family has participated in discharge planning

Evidence Based Grading Scale:

A: Randomized controlled trial: large sample

B: Randomized controlled trial: small sample

C: Prospective trial or large case series

D: Retrospective analysis

E: Expert opinion or consensus

F: Basic laboratory research

S: Review article

M: Meta-analysis

Q: Decision analysis

L: Legal requirement

O: Other evidence

X: No evidence

CLINICAL ALGORITHM(S)

An algorithm summarizing the approach to the assessment and management of children aged 60 days to 17 years with community acquired pneumonia is provided in the guideline document

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence is identified and graded for each recommendation (see "Major Recommendations"). In the guideline document, each cited reference is graded individually.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Effective medical assessment and management of children aged 60 days to 17 years with community acquired pneumonia.

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

These recommendations result from the review of literature and practices current at the time of their formulations. This protocol does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the guidelines to meet the specific and unique requirements of individual patients. Adherence to this pathway is voluntary. The physician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The implementation process for each Children´s Hospital Medical Center guideline is a phase in a larger process of Guideline Development. This process is utilized for every guideline but is not addressed in the content of every guideline.

At the start of each guideline, a projected implementation date is determined. Reservations for education are then made (Grand Rounds, Patient Services, Inservices). When the guideline is complete and enters into the Approval Process, Education planning begins. Changes created by the guideline are outlined as well as anticipated outcomes. The implementation date is confirmed. Education is provided. The guideline is implemented and pilot information collection started. The Guideline Coordinator makes daily rounds and eligible children are followed to document the use of the guideline. The implementation phase aids in finding areas for improvement or question. When issues identified are improved the guideline progresses to the monitoring phase.

IMPLEMENTATION TOOLS

Clinical Algorithm
Patient Resources

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence-based clinical practice guideline of community-acquired pneumonia in children 60 days to 17 years of age. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2000. 11 p. [82 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Jul

GUIDELINE DEVELOPER(S)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

SOURCE(S) OF FUNDING

Cincinnati Children's Hospital Medical Center

GUIDELINE COMMITTEE

Community Acquired Pneumonia Team 1999-2000

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

An update is not in progress at this time.

GUIDELINE AVAILABILITY

Electronic copies: Available from the Cincinnati Children's Hospital Medical Center.

For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Children's Hospital Medical Center Health Policy and Clinical Effectiveness Department at HPCEInfo@chmcc.org.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

The following is available:

- Pneumonia, communicty acquired. Cincinnati, OH: Cincinnati Children's Hospital Medical Center, 2000. (Patient Education Pamphlet 1058).

Available online at the Cincinnati Children's Hospital Medical Center Web site.

authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC STATUS

This summary was completed by ECRI on March 15, 2001. The information was verified by the guideline developer as of June 15, 2001.

COPYRIGHT STATEMENT

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